

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LITHOLOGIC LOG AND LITHIUM CONTENT OF SEDIMENTS DRILLED IN
CLAYTON VALLEY, ESMERALDA COUNTY, NEVADA

By

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This report is preliminary and has not
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with U.S. Geological Survey standards

INTRODUCTION

This report presents lithologic and lithium logs of core drilled in Clayton Valley, Nevada. Drilling was done to collect base data from a known lithium-rich area, and to compare these data with other areas drilled.

Drilling was performed in October and November of 1977, under terms of an interagency cooperative agreement with the Division of Energy Storage Systems and the Division of Uranium Resources and Enrichment of the U.S. Department of Energy. Chemical analyses performed by the U.S. Geological Survey in Denver, Colorado, are designated as "labs" in this text. Analyses in the field performed by the U.S. Geological Survey are designated as "field" in this text.

Clayton Valley is a closed basin within the Basin and Range physiographic province. It is bounded by Clayton Ridge and the Montezuma Range to the east, Palmetto Mountains and Silver Peak Range to the south, Silver Peak Range to the west, and Big Smokey Valley, Alkali Flat, Paymaster Ridge and the Weepah Hills to the north (fig. 1). A playa in the northern part of the valley occupies about 40 mi². It is the lowest point topographically of a series of playa filled valleys consisting of Alkali Flat (Valley), Big Smokey Valley, Fish Lake Valley, Mudlake, and Stonewall Flat. These surrounding valleys probably contribute ground water to Clayton Valley (Rush and others, 1971), which may be a reason for the anomalous amounts of lithium in the sediments and brines. Of these valleys, Alkali Flat has the highest lithium values in sediments (Pantea and others, 1981), whereas Big Smokey Valley and Fish Lake Valley have the highest lithium values in water (Asher-Bolinder and others, 1980).

Seven drill sites were chosen in the northern part of Clayton Valley. The holes are outside of the playa with the exception of CV-4 and CV-5A, which are in the playa as shown on figure 1.

CV-1 is on the northeastern periphery of the playa at lat. 37°47' N., long. 117°35' W., and penetrated 395 feet. The sediments penetrated were sand and gravel with some beds of limestone and mud (fig. 2). Lithium in sediments ranged from 33 parts per million (ppm) to 310 ppm averaging 100.7 ppm for 10 samples analyzed. Lithium in ground water ranged from 32 ppm to 60 ppm averaging 37.7 for 7 samples analyzed by labs, and from 23 ppm to 60 ppm averaging 35 ppm for 8 samples analyzed in the field.

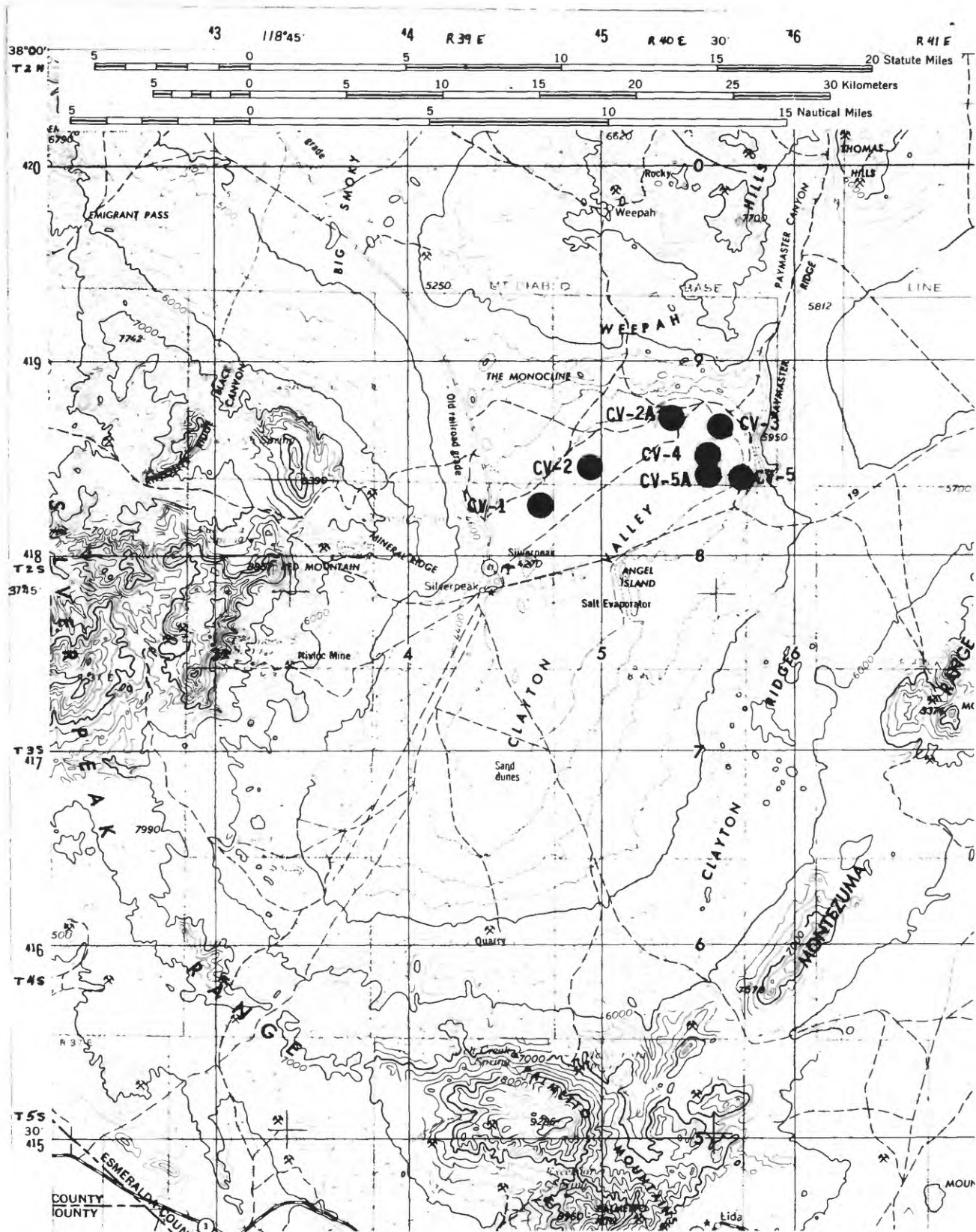


Figure 1. Index map of a part of Esmeralda County, Nevada, showing locations of drill sites. Reduction from U.S. Geological Survey, Goldfield (1954) quadrangle, scale 1:250,000.

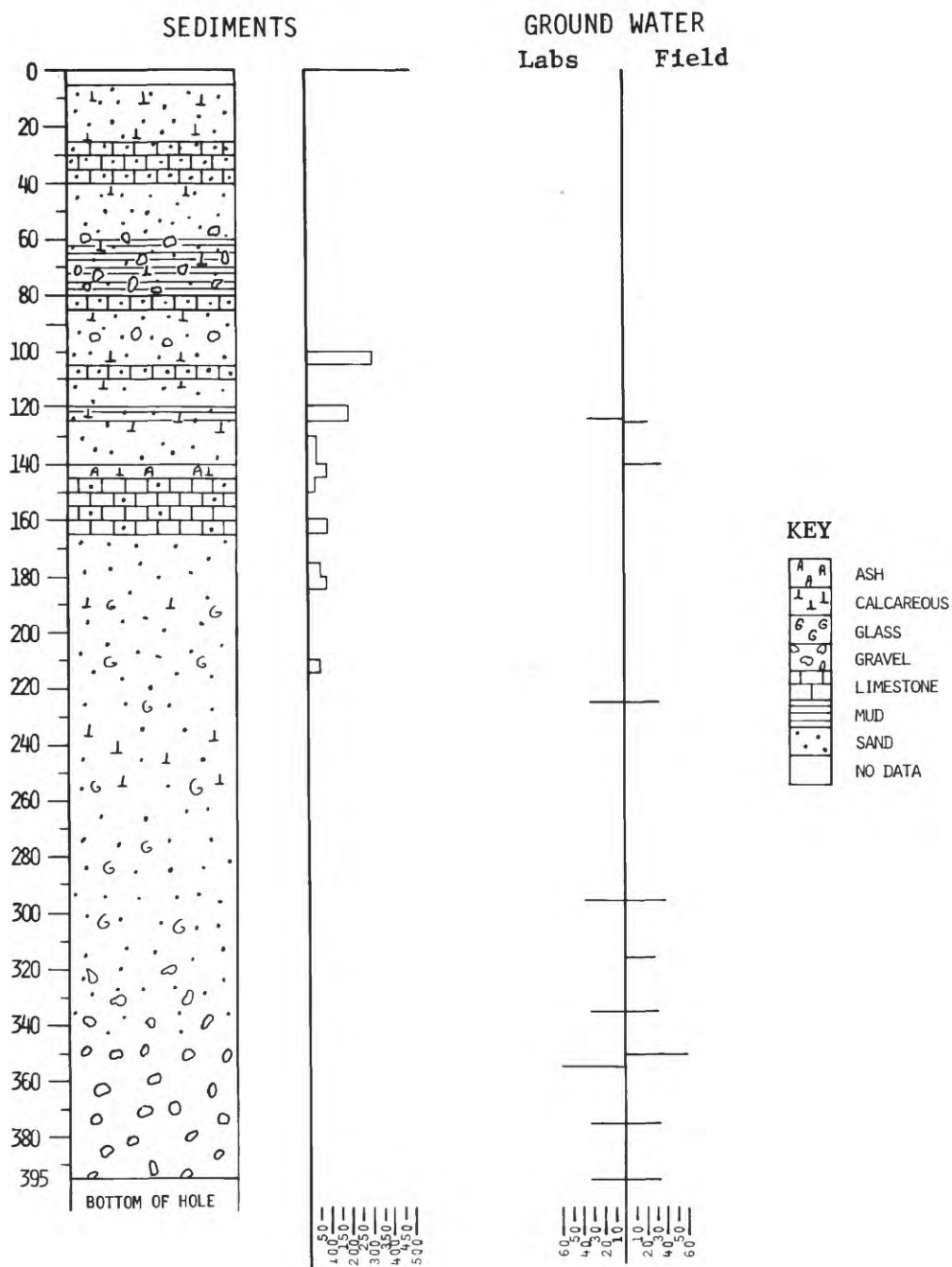


Figure 2.--Lithologic log in feet, and lithium concentration logs in parts per million for sediments and ground water in CV-1.

CV-2 is on the northeastern periphery of the playa at lat. 37°48' N. long. 117°35' W., and penetrated 395 feet. Sediments encountered were sand and sandy clay with some beds of mud, limestone, and tuff (fig. 3). Lithium values in sediments ranged from 34 ppm to 930 ppm averaging 209.4 ppm for 76 samples analyzed. Lithium values in ground water ranged from 28 ppm to 55 ppm averaging 38.6 for 9 samples analyzed by labs, and from 27 ppm to 55 ppm averaging 35.6 for 16 samples analyzed in the field.

CV-2A is located on the north periphery of the playa at lat. 37°50' N., long. 117°31' W., and penetrated 275 feet. The sediments were limestone and gravel with some beds of clay, chert, sand, or tuff (fig. 4). Lithium values in sediments ranged from 130 ppm to 390 ppm averaging 248.5 ppm for 7 samples analyzed. Lithium values in ground water ranged from 44 ppm to 100 ppm averaging 67.3 ppm for 6 samples analyzed by labs, and from 38 ppm to 100 ppm averaging 63.1 ppm for 7 samples analyzed in the field.

CV-3 is located on the northeastern periphery of the playa at lat. 37°49' N., long. 117°30' W., and penetrated to 615 feet. Sediments encountered were muddy clay, clay, limestone, and sand, with some beds of ash or gravel (fig. 5). Lithium values in sediments ranged from 16 ppm to 780 ppm averaging 168.4 ppm for 119 samples analyzed. Lithium values in ground water ranged from 41 ppm to 91 ppm averaging 52.9 ppm for 14 samples analyzed by lab, and from 41 ppm to 160 ppm averaging 69 ppm for 16 samples analyzed in the field.

CV-4 is located in the northern end of the playa at lat. 37°49' N., long. 117°30' W., and penetrated 795 feet. Sediments penetrated were mud and sand with beds of limestone, clay and tuff (fig. 6). This hole also contained some gypsum, travertine, and halite. Lithium values in sediments ranged from 39 ppm to 1840 ppm averaging 455.7 ppm for 114 samples analyzed. Lithium in ground water ranged from 44 ppm to 190 ppm averaging 109.2 for 16 samples analyzed by labs, and from 44 ppm to 190 ppm averaging 103 ppm for 18 samples analyzed in the field.

CV-5 is located on the eastern periphery of the playa at lat. 37°48' N., long. 117°29' W., and penetrated 479 feet. Sediments encountered were sand and gravel with some beds of clay, clayey mud, and limestone (fig. 7). Lithium values in sediments ranged from 62 ppm to 770 ppm averaging 295.2 for 14 samples analyzed. Lithium values in ground water ranged from 24 ppm to 110 ppm averaging 69.3 for 11 samples analyzed by labs, and from 24 ppm to 110 ppm averaging 65.75 for 12 samples analyzed in the field.

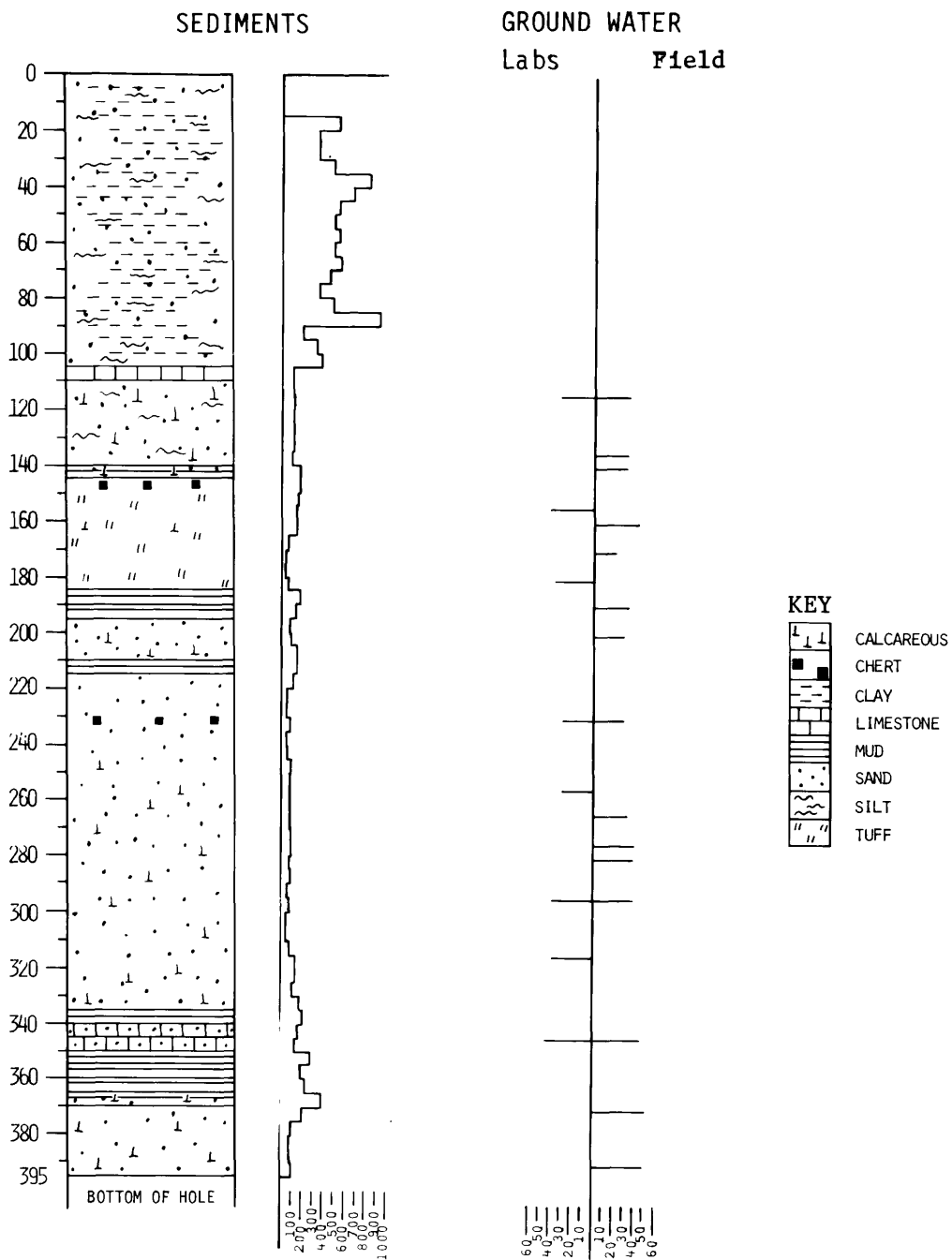


Figure 3.--Lithologic log in feet, and lithium concentration logs in parts per million for sediments and ground water in CV-2.

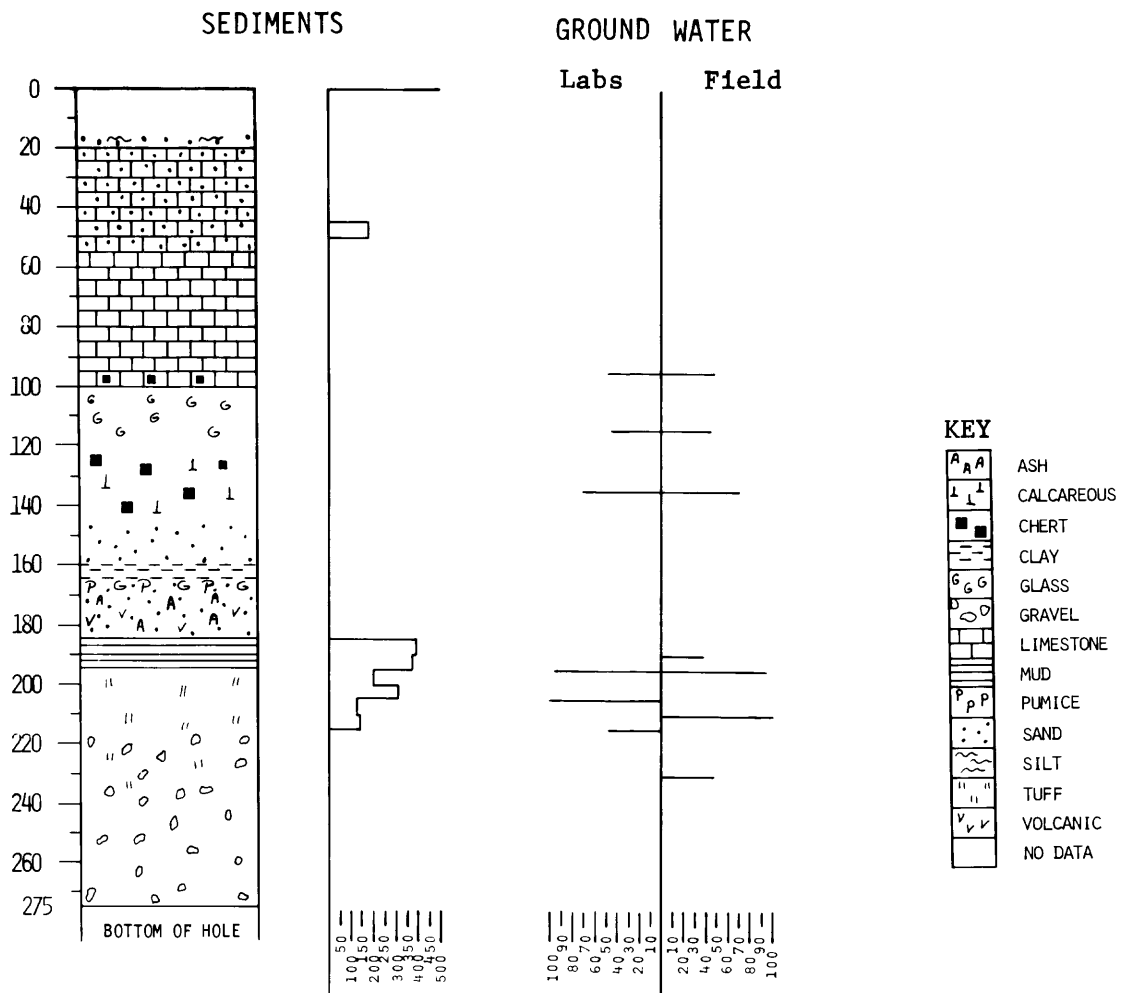


Figure 4.--Lithologic log in feet, and lithium concentration logs in parts per million for sediments and ground water in CV-2A.

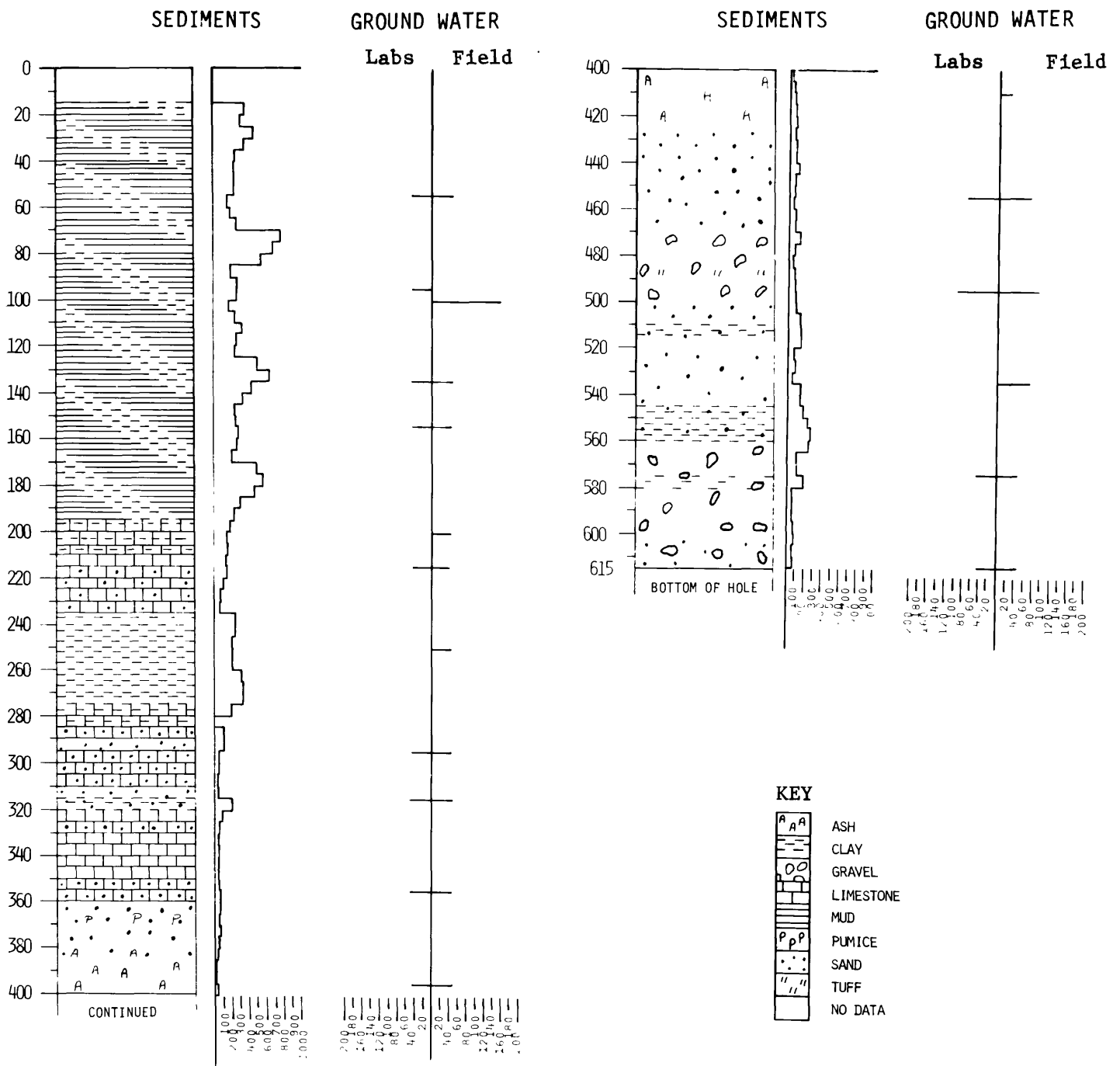


Figure 5.--Lithologic log in feet, and lithium concentration logs in parts per million for sediments and ground water in CV-3.

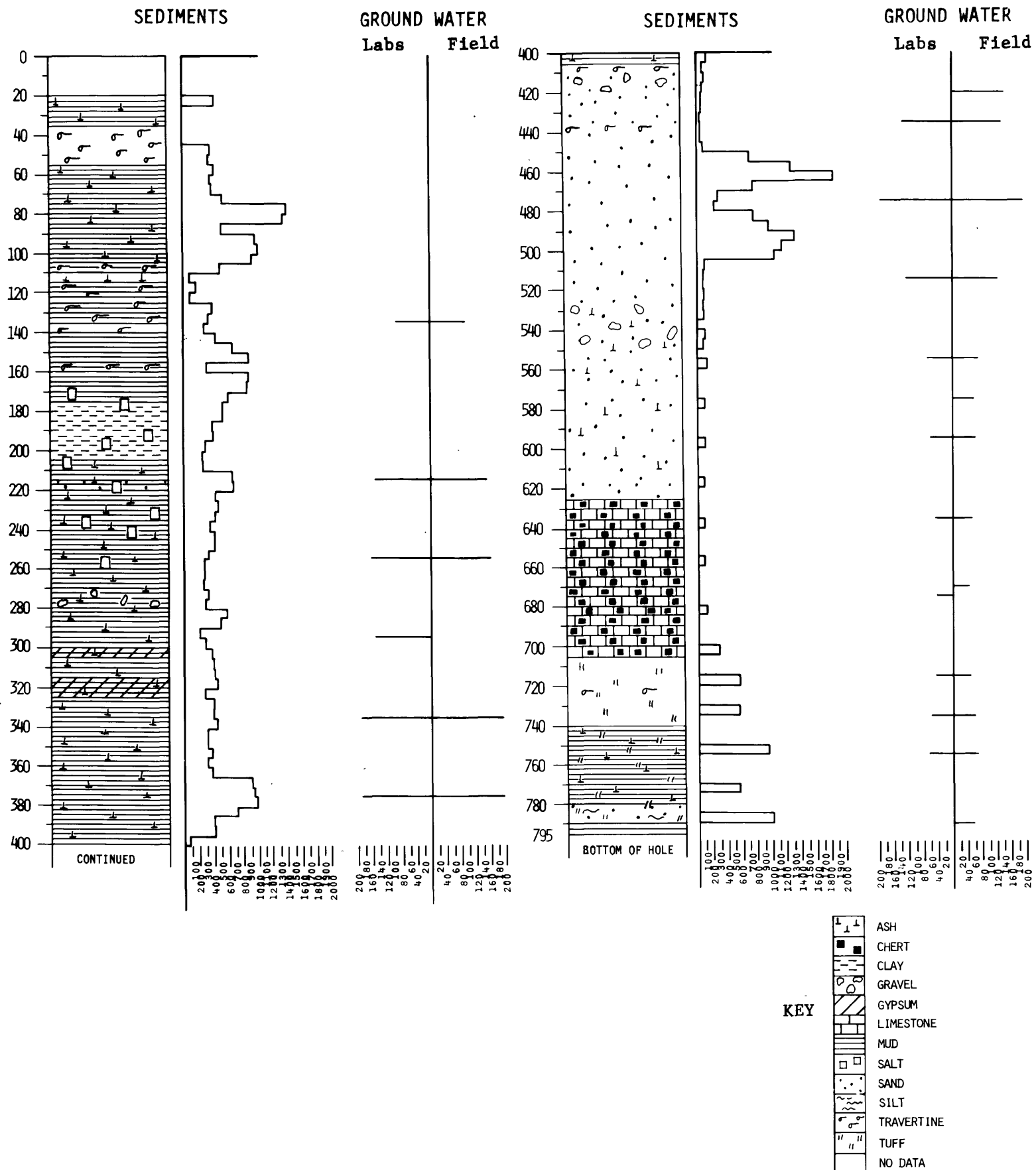


Figure 6.--Lithologic log in feet, and lithium concentration log in parts per million for sediments and ground water in CV-4.

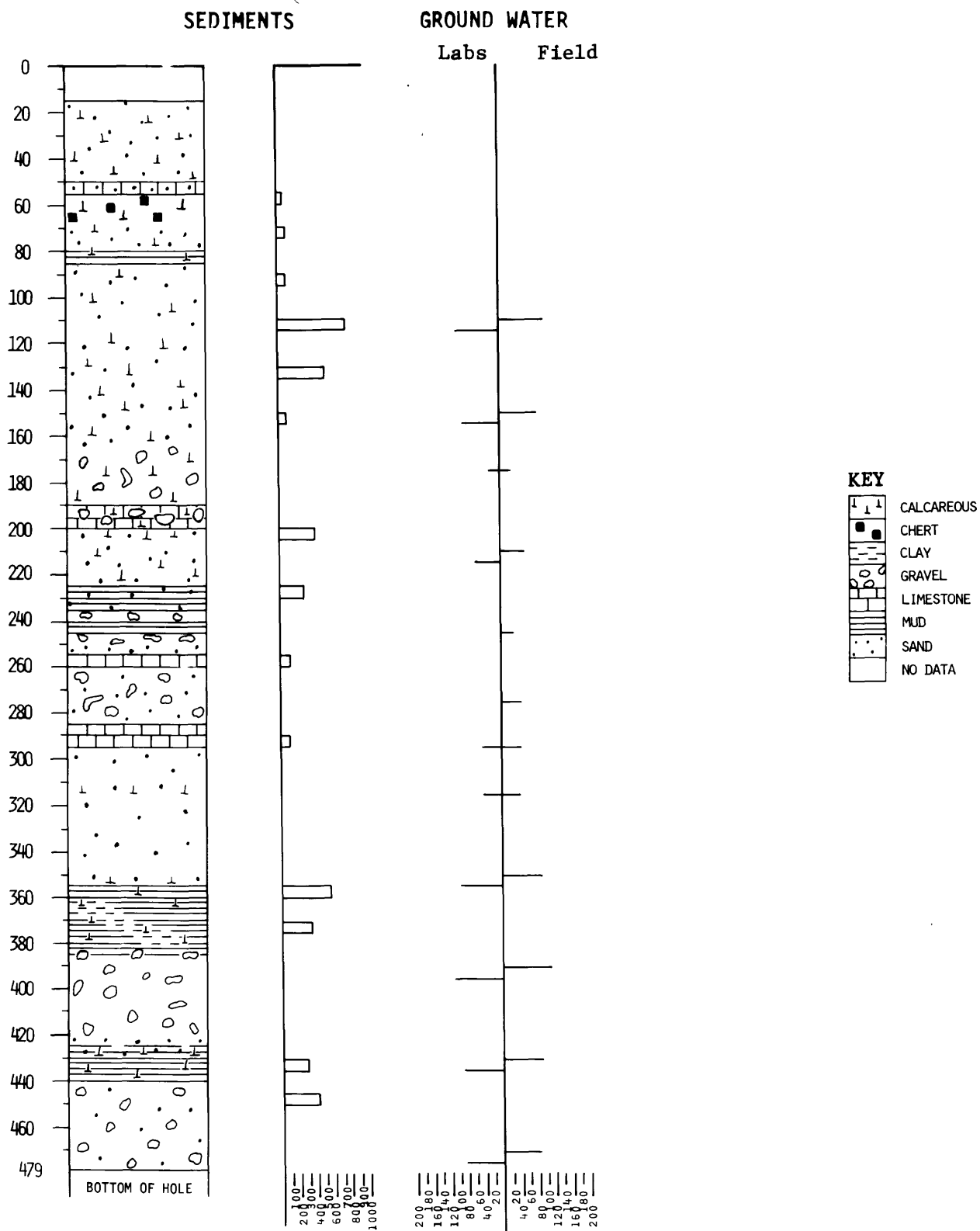


Figure 7.--Lithologic log in feet, and lithium concentration log in parts per million for sediments and ground water in CV-5.

CV-5A is located in the eastern part of the playa, south of CV-4 at lat. 37°48' N., long. 117°30' W., and penetrated 740 feet. Sediments encountered were clayey muds and halite with some beds of clay and sand (fig. 8). Of the 7 holes, only CV-4 and CV-5A are within the playa. Both contain halite, but only CV-5A contains halite as major beds of 20 feet or more. CV-5A is the only hole that does not have a limestone bed in it. Lithium values in sediments ranged from 160 ppm to 960 ppm averaging 397.5 for 24 samples analyzed. Lithium in ground water ranged from 100 ppm to 390 ppm averaging 292.6 for 15 samples analyzed by labs, and from 100 ppm to 640 ppm averaging 300.9 for 17 samples analyzed in the field.

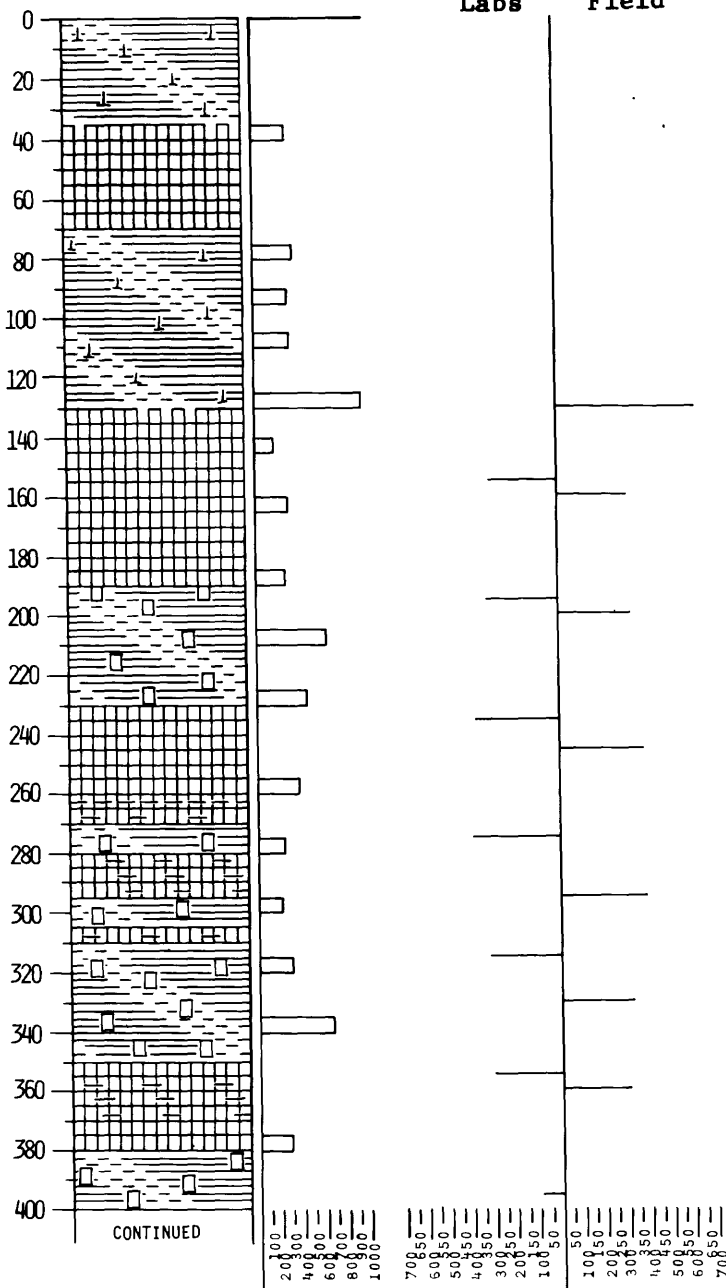
Additional analyses were performed on selected samples from CV-1, CV-2, CV-5, and CV-5A for thorium and uranium (table 1). Field numbers are the depths at which the samples were taken. There is no systematic relationship between the values.

SEDIMENTS

GROUND WATER

Labs

Field



SEDIMENTS

GROUND WATER

Labs

Field

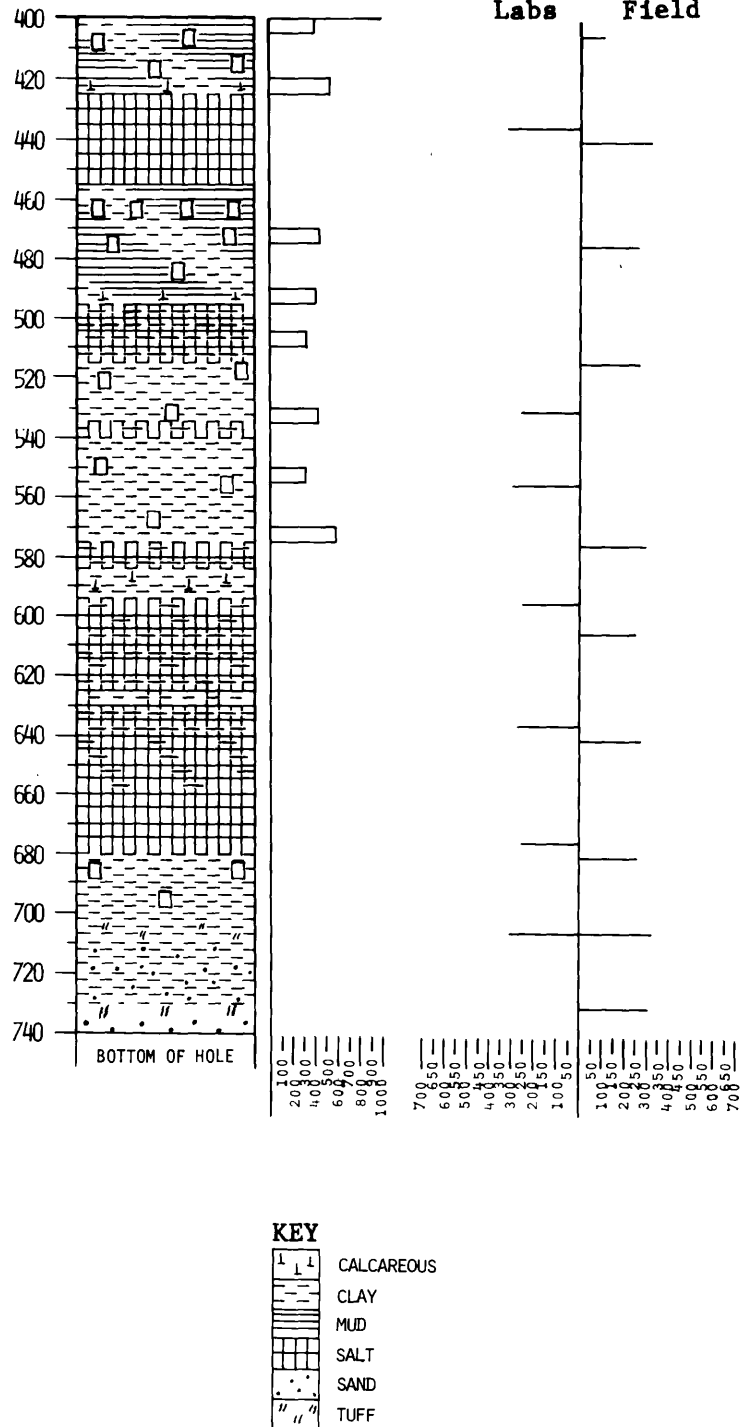


Figure 8.--Lithologic log in feet, and lithium concentration logs in parts per million for sediments and ground water in CV-5A.

Table 1.--Analyses of selected samples from CV-1, CV-2, CV-5, and CV-5A,
Clayton Valley, Nevada
[Analysts-M. Coughlin, H. T. Millard, M. Schneider,
W. R. Stang, B. Vaughn, U.S. Geological Survey]

	LAB. NO.	FIELD NO.	TH PPM	U PPM	SAMPLE DESCRIPTION
CV-1	D-213884	40	11.	7.34	Playa sediment
	D-213885	115	19.	4.75	Playa sediment
	D-213886	125	<27.	4.6	Playa sediment
	D-213887	135	<7.6	4.70	Playa sediment
	D-213888	136	<8.5	4.81	Playa sediment
	D-213889	138	<5.8	2.10	Playa sediment
	D-213890	185	25.3	6.42	Playa sediment
	D-213891	215	<9.0	4.19	Playa sediment
CV-2	D-213892	30	<9.0	6.47	Playa sediment
	D-213893	40	<7.6	3.98	Playa sediment
	D-213894	85	<11.	8.01	Playa sediment
	D-213895	95	17.3	3.20	Playa sediment
	D-213896	105	12.4	2.80	Playa sediment
	D-213897	110	<9.4	25.9	Playa sediment
	D-213898	150	22.3	17.8	Playa sediment
	D-213899	170	13.1	7.59	Playa sediment
	D-213900	210	16.1	4.26	Playa sediment
	D-213901	240	16.7	4.20	Playa sediment
	D-213902	280	13.7	4.19	Playa sediment
CV-5	D-213930	40	14.	4.20	Playa sediment
	D-213931	110	<11.	5.29	Playa sediment
	D-213932	130	14.	6.60	Playa sediment
	D-213933	145	7.8	1.2	Playa sediment
	D-213934	165	<6.4	2.83	Playa sediment
	D-213935	210	18.7	7.64	Playa sediment
	D-213936	230	19.5	3.51	Playa sediment
	D-213937	260	16.2	2.73	Playa sediment
	D-213938	300	8.21	1.51	Playa sediment
	D-213939	340	15.3	6.80	Playa sediment
CV-5A	D-213876	380	<8.8	5.08	Playa sediment
	D-213877	425	<10.	8.28	Playa sediment
	D-213878	510	<8.4	4.42	Playa sediment
	D-213879	575	<13.	11.5	Playa sediment
	D-213880	700	<9.3	4.98	Playa sediment
	D-213881	715	<6.7	3.54	Playa sediment
	D-213882	720	<8.1	5.15	Playa sediment
	D-213883	730	<7.2	4.13	Playa sediment

REFERENCES

- Asher-Bolinder, Sigrid, Vine, J. D., Glanzman, R. K., and Davis, J. R., 1980, Chemistry of ground water from test holes drilled in Esmeralda and Nye Counties, Nevada: U.S. Geological Survey Open-File Report 80-672, 31 p.
- Pantea, M. P., Asher-Bolinder, Sigrid, Vine, J. D., 1981, Lithology and lithium content of sediments in basins surrounding Clayton Valley, Esmeralda and Nye Counties, Nevada: U.S. Geological Survey Open-File Report 81-962, 23 p.
- Rush, F. E., Scott, B. R., Van Denburg, A. S., and Vasey, B. J., 1971, Water resources and interbasin flows: Nevada Division of Water Resources, State Engineers Office, map, scale 1:750,000.